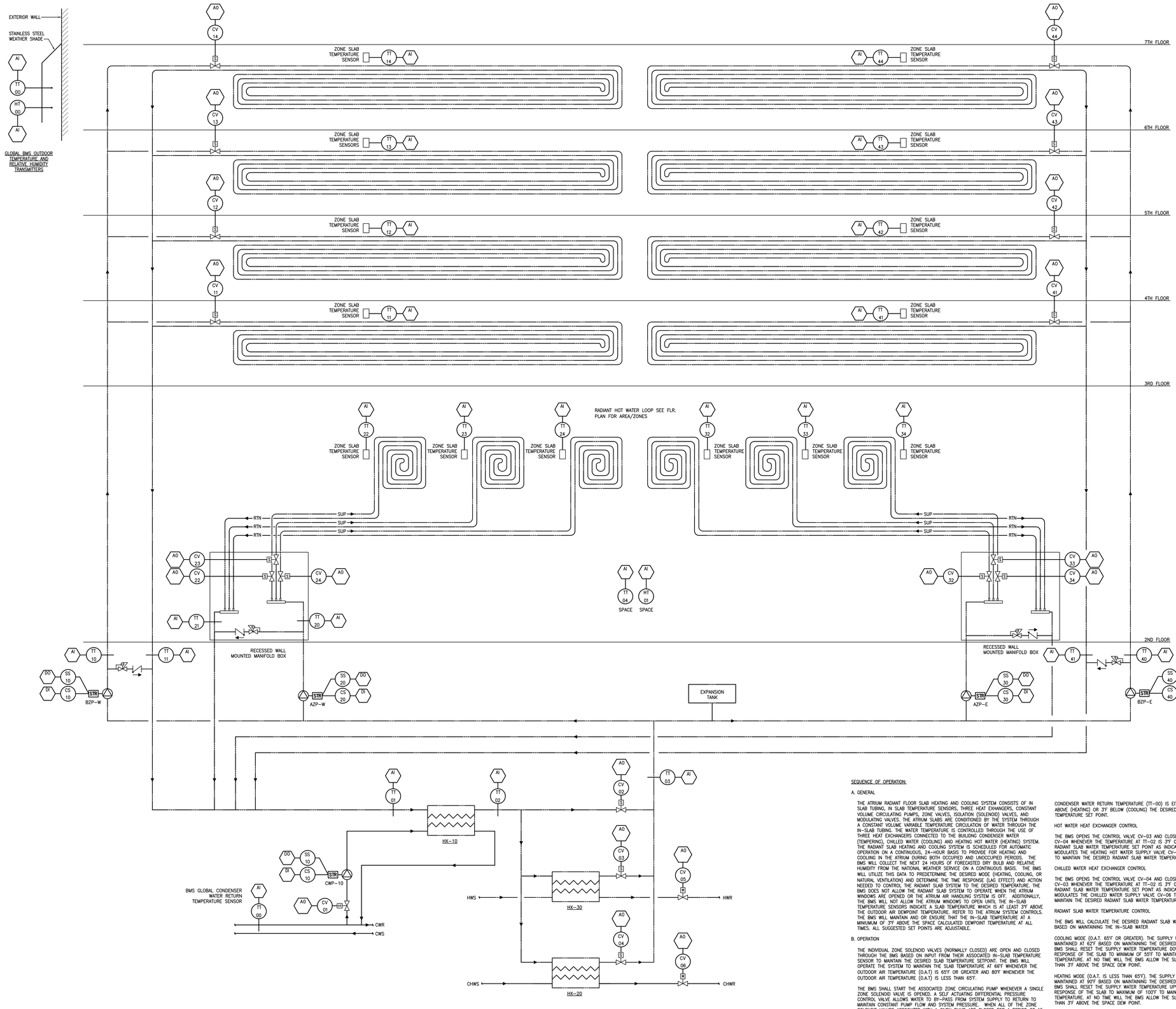

SEQUENCE OF OPERATION:

A. GENERAL

THE ATRIUM RADIANT FLOOR SLAB HEATING AND COOLING SYSTEM CONSISTS OF IN SLAB TUBING, IN SLAB TEMPERATURE SENSORS, THREE HEAT EXHANGERS, CONSTANT VOLUME CIRCULATING PUMPS, ZONE VALVES, ISOLATION (SOLENOID) VALVES, AND MODULATING VALVES. THE ATRIUM SLABS ARE CONDITIONED BY THE SYSTEM THROUGH A CONSTANT VOLUME VARIABLE TEMPERATURE CIRCULATION OF WATER THROUGH THE IN-SLAB TUBING. THE WATER TEMPERATURE IS CONTROLLED THROUGH THE USE OF THREE HEAT EXCHANGERS CONNECTED TO THE BUILDING CONDENSER WATER (TEMPERING), CHILLED WATER (COOLING) AND HEATING HOT WATER (HEATING) SYSTEM. THE RADIANT SLAB HEATING AND COOLING SYSTEM IS SCHEDULED FOR AUTOMATIC OPERATION ON A CONTINUOUS, 24-HOUR BASIS TO PROVIDE FOR HEATING AND COOLING IN THE ATRIUM DURING BOTH OCCUPIED AND UNOCCUPIED PERIODS. THE BMS WILL COLLECT THE NEXT 24 HOURS OF FORECASTED DRY BULB AND RELATIVE HUMIDITY FROM THE NATIONAL WEATHER SERVICE ON A CONTINUOUS BASIS. THE BMS WILL UTILIZE THIS DATA TO PREDETERMINE THE DESIRED MODE (HEATING, COOLING, OR NATURAL VENTILATION) AND DETERMINE THE TIME RESPONSE (LAG EFFECT) AND ACTION NEEDED TO CONTROL THE RADIANT SLAB SYSTEM TO THE DESIRED TEMPERATURE. THE BMS DOES NOT ALLOW THE RADIANT SLAB SYSTEM TO OPERATE WHEN THE ATRIUM WINDOWS ARE OPENED OR THE ATRIUM AIR HANDLING SYSTEM IS OFF. ADDITIONALLY, THE BMS WILL NOT ALLOW THE ATRIUM WINDOWS TO OPEN UNTIL THE IN-SLAB TEMPERATURE SENSORS INDICATE A SLAB TEMPERATURE WHICH IS AT LEAST 3°F ABOVE THE OUTDOOR AIR DEWPOINT TEMPERATURE. REFER TO THE ATRIUM SYSTEM CONTROLS. THE BMS WILL MAINTAIN AND OR ENSURE THAT THE IN-SLAB TEMPERATURE AT A MINIMUM OF 3°F ABOVE THE SPACE CALCULATED DEWPOINT TEMPERATURE AT ALL TIMES. ALL SUGGESTED SET POINTS ARE ADJUSTABLE.

B. OPERATION

THE INDIVIDUAL ZONE SOLENOID VALVES (NORMALLY CLOSED) ARE OPEN AND CLOSED THROUGH THE BMS BASED ON INPUT FROM THEIR ASSOCIATED IN-SLAB TEMPERATURE SENSOR TO MAINTAIN THE DESIRED SLAB TEMPERATURE SETPOINT. THE BMS WILL OPERATE THE SYSTEM TO MAINTAIN THE SLAB TEMPERATURE AT 66°F WHENEVER THE OUTDOOR AIR TEMPERATURE (O.A.T) IS 65°F OR GREATER AND 80°F WHENEVER THE OUTDOOR AIR TEMPERATURE (O.A.T) IS LESS THAN 65°F.

THE BMS SHALL START THE ASSOCIATED ZONE CIRCULATING PUMP WHENEVER A SINGLE ZONE SOLENOID VALVE IS OPENED. A SELF ACTUATING DIFFERENTIAL PRESSURE CONTROL VALVE ALLOWS WATER TO BY-PASS FROM SYSTEM SUPPLY TO RETURN TO MAINTAIN CONSTANT PUMP FLOW AND SYSTEM PRESSURE. WHEN ALL OF THE ZONE SOLENOID VALVES ASSOCIATED WITH A GIVEN PUMP ARE CLOSED FOR A PERIOD OF 15 MINUTES (ADJ.), THE BMS WILL DE-ENERGIZED THE ZONE CIRCULATING PUMP.

CONDENSER WATER HEAT EXCHANGER CONTROL

THE BMS OPENS AND PROVES CONTROL CV-01 AND STARTS THE HEAT EXCHANGER PUMP (CWP-10) WHENEVER THE RADIANT SLAB SYSTEM IS IN OPERATION AND THE CONDENSER WATER RETURN TEMPERATURE (TT-00) IS EITHER A MINIMUM OF 3°F ABOVE (HEATING) OR 3°F BELOW (COOLING) THE DESIRED RADIANT SLAB WATER TEMPERATURE SET POINT.

HOT WATER HEAT EXCHANGER CONTROL

THE BMS OPENS THE CONTROL VALVE CV-03 AND CLOSES CONTROL CV-02 AND CV-04 WHENEVER THE TEMPERATURE AT TT-02 IS 3°F OR MORE BELOW THE DESIRED RADIANT SLAB WATER TEMPERATURE SET POINT AS INDICATED AT TT-03. THE BMS MODULATES THE HEATING HOT WATER SUPPLY VALVE CV-05 TO THE HEAT EXCHANGER TO MAINTAIN THE DESIRED RADIANT SLAB WATER TEMPERATURE SET POINT AT TT-03.

CHILLED WATER HEAT EXCHANGER CONTROL

THE BMS OPENS THE CONTROL VALVE CV-04 AND CLOSES CONTROL CV-02 AND CV-03 WHENEVER THE TEMPERATURE AT TT-02 IS 3°F OR HIGHER THAN THE DESIRED RADIANT SLAB WATER TEMPERATURE SET POINT AS INDICATED AT TT-03. THE BMS MODULATES THE CHILLED WATER SUPPLY VALVE CV-06 TO THE HEAT EXCHANGER TO MAINTAIN THE DESIRED RADIANT SLAB WATER TEMPERATURE SET POINT AT TT-03.

RADIANT SLAB WATER TEMPERATURE CONTROL

THE BMS WILL CALCULATE THE DESIRED RADIANT SLAB WATER TEMPERATURE SET POINT BASED ON MAINTAINING THE IN-SLAB WATER

COOLING MODE (O.A.T. 65°F OR GREATER). THE SUPPLY WATER TEMPERATURE IS MAINTAINED AT 62°F BASED ON MAINTAINING THE DESIRED IN-SLAB TEMPERATURE. THE BMS SHALL RESET THE SUPPLY WATER TEMPERATURE DOWNWARD BASED ON THE TIME RESPONSE OF THE SLAB TO MINIMUM OF 55°F TO MAINTAIN THE DESIRED IN SLAB TEMPERATURE. AT NO TIME WILL THE BMS ALLOW THE SLAB TEMPERATURE TO BE LESS THAN 3°F ABOVE THE SPACE DEW POINT.

HEATING MODE (O.A.T. IS LESS THAN 65°F). THE SUPPLY WATER TEMPERATURE IS MAINTAINED AT 90°F BASED ON MAINTAINING THE DESIRED IN-SLAB TEMPERATURE. THE BMS SHALL RESET THE SUPPLY WATER TEMPERATURE UPWARD BASED ON THE TIME RESPONSE OF THE SLAB TO MAXIMUM OF 100°F TO MAINTAIN THE DESIRED IN SLAB TEMPERATURE. AT NO TIME WILL THE BMS ALLOW THE SLAB TEMPERATURE TO BE LESS THAN 3°F ABOVE THE SPACE DEW POINT.

ALARMS AND SAFETIES

SLAB TEMPERATURE IS WITHIN 3 OF SPACE DEW POINT THE BMS WILL ALARM AND CLOSE THE SLAB ZONE VALVE.

ALL MOTOR CURRENT TRANSDUCERS (OR VFD EQUIVALENT SIGNAL) SHALL TRANSMIT AN ALARM ON FAILURE.

1 M-732 ATRIA RADIANT FLOOR CONTROL DIAGRAM

SCALE: NONE

NOTE: TYPICAL OF BOTH EAST AND WEST ATRIA

GSA
GENERAL SERVICES ADMINISTRATION
NATIONAL CAPITOL REGION
7TH & D STREETS, SW
ROOM 1619
WASHINGTON, DC 20405

shalom baranes associates | architects

SYSKA HENNESSY GROUP
A member company of SH Group, Inc.

AMT
A. MORTON THOMAS AND ASSOCIATES, INC.
CONSULTING ENGINEERS

Thornton•Tomasetti•Cutts
A Division of Thornton•Tomasetti Group, Inc.

CAPE ENVIRONMENTAL

ECS LLC
MID-ATLANTIC

GreenShape

VERTRAN ENTERPRISES, LTD.

CERTIFICATIONS

KEY PLAN

MARK	DATE	DESCRIPTION

REVISION NOTES

GRAPHIC SCALE(S)

CONTRACTORS		
	A/E CON. NO.	GS11P02MKC0057
	A/E TASK NO.	X-00-00-XX-0000
	CONS. CONTR.	XX-00X-00-XXX-0000
	CONS. WORK	X-00-00-XX-0000
	PRIME A/E	SHALOM BARANES ASSOCIATES ARCHITECTS
	SUB A/E	SYSKA HENNESSY GROUP, INC.
	CONSTR. CON.	XXXXXXXXXX
BUILDING	NAME	CENTRAL OFFICE BUILDING
	STREET	18TH & F STREETS, NW
	CITY/ST./ZIP	WASHINGTON DC 20405
	BUILDING NO.	DC0021
	OTHER	
	BUILDING NOs.	
	FACILITY CODE	XXXX
PROJECT	PROJECT TITLE	1800 F STREET MODERNIZATION
	PROJECT DESCRIPTION	CENTRAL OFFICE BUILDING XXXXXXXXXX
	PROJECT NO.	SDC00142
	GSA PM	ROBERT VAUGHN
	SUBMISSION	BID SET
	SUB. DATE	03/01/2010
DRAWING	DRAWING TITLE	HW RADIANT HEATING CONTROL DIAGRAM
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	FLOOR NO.	.
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	CHECKED BY	XXX SHEET SIZE: 36 X 48
	DRAWING NO.	M 7 32
		DISCIPLINE SHEET TYPE SEQUENCE
		SHEET 000 OF 000